# NTA CUET (UG)

# 68 (2025-22) PAST YEARS SOLVED PAPERS & MOCK TESTS

## Science Stream

Physics - 15+2
Chemistry - 15+2
Biology - 15+2
Mathematics - 15+2

3200+ MCQs

WITH FREE ONLINE CBT

- 2 Mock Tests per Subject as per NTA CUET Latest Pattern & Syllabus
- Subject-wise Combo of 15 Past Solved Papers from 2025-2022 (Physics, Chemistry, Biology & Mathematics)
- Detailed Explanation of Each Question
- Trend Analysis of NTA CUET PYQs (2025-2023)

# Syllabus for CUET Biology

**Note:** There will be one Question Paper which will have 50 questions. All questions are compulsory.

## Syllabus

- **Unit-I:** Reproduction
  Sexual Reproduction in Flowering Plants, Human Reproduction, Reproductive Health.
- **Unit-II:** Genetics and Evolution
  Principles of Inheritance and Variation, Molecular Basis of Inheritance, Evolution
- **Unit-III:** Biology and Human Welfare
  Human Health and Disease, Microbes in Human Welfare
- **Unit-IV:** Biotechnology and its Applications
  Biotechnology : Principles and Processes, Biotechnology and its Applications
- **Unit-V:** Ecology and Environment
  Organisms and Populations, Ecosystem, Biodiversity and Conservation

## Biology Paper Analysis

### Chapter-wise Number of Questions Analysis of NTA CUET Papers

| S. No. | Name of the Chapter | 2024 | | 2025 | |
|---|---|---|---|---|---|
| | | 19th July | 15th May | 3rd June | 15th May |
| 1. | Sexual Reproduction in Flowering Plants | 3 | 3 | 3 | 3 |
| 2. | Human Reproduction | 5 | 3 | 4 | 4 |
| 3. | Reproductive Health | 3 | 5 | 3 | 3 |
| 4. | Principles of Inheritance and Variation | 4 | 3 | 3 | 3 |
| 5. | Molecular Basis of Inheritance | 4 | 5 | 2 | 4 |
| 6. | Evolution | 3 | 4 | 5 | 3 |
| 7. | Human Health and Diseases | 4 | 4 | 6 | 5 |
| 8. | Microbes in Human Welfare | 3 | 3 | 4 | 5 |
| 9. | Biotechnology: Principles and Processes | 3 | 4 | 5 | 5 |
| 10. | Biotechnology and its Application | 5 | 4 | 5 | 5 |
| 11. | Organisms and Populations | 5 | 3 | 0 | 3 |
| 12. | Ecosystem | 4 | 4 | 8 | 3 |
| 13. | Biodiversity and Conservation | 4 | 5 | 2 | 4 |

# Contents

## Physics



→ Select **Test**
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# Chemistry

## NTA CUET Solved Papers 148-268



## Mock Test Papers 269-276



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# Mathematics

## NTA CUET Solved Papers 277-424



## Mock Test Papers 425-435



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# Biology

## NTA CUET Solved Papers 436-548



## Mock Test Papers 549-560



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→ Press **Start**

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# PHYSICS

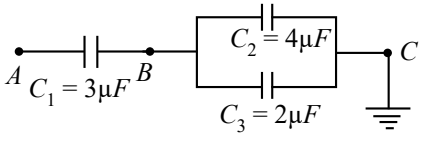
## NTA CUET PAPER
## (2ND JUNE 2025, SHIFT-1)

### Instructions

***There will be 50 questions. All questions are compulsory. Each question carries 5 marks. One mark will be deducted for a wrong answer.***

***Full Marks: 250*** ***(Time: 60 Minutes)***

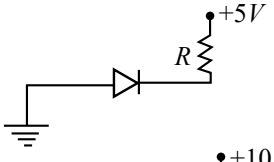
**1.** In the given circuit, if the potential at $A$ is 50 V, then potential at $B$ is:

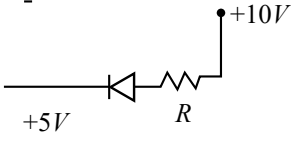


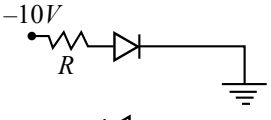

(*a*) $\frac{50}{3}V$ (*b*) $\frac{100}{3}V$

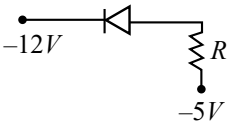
(*c*) $50V$ (*d*) $25V$

**2.** Four diode connections are given below. Identify the diagram in which the diode is forward biased.

A. 


B. 


C. 


D. 


Choose the **correct** answer from the options given below:

(*a*) B only (*b*) B and D only

(*c*) B, C and D only (*d*) B and C only

**3.** The magnetic field strength in silicon is 1000 $A/m$. If its magnetic susceptibility is $-0.3 \times 10^{-5}$, then the intensity of magnetization will be:

(*a*) $3 \times 10^{-3}\ A/m$ (*b*) $-3 \times 10^{-3}\ A/m$

(*c*) $4.5 \times 10^{-3}\ A/m$ (*d*) $-6.0 \times 10^{-3}\ A/m$

**4.** Match List-I with List-II.

| List-I | | List-II | |
|---|---|---|---|
| A. | Intrinsic semiconductor | I. | Number of conduction electrons >> number of holes |
| B. | *n*-type semiconductor | II. | Number of conduction electrons << number of holes |
| C. | *p*-type semiconductor | III. | Net current is zero |
| D. | *p-n* junction under equilibrium | IV. | Number of conduction electrons = number of holes |

Choose the **correct** answer from the options given below:

(*a*) A-II, B-IV, C-I, D-III (*b*) A-IV, B-II, C-I, D-III

(*c*) A-IV, B-I, C-II, D-III (*d*) A-II, B-I, C-IV, D-III

**5.** A transformer has 400 turns in the primary coil and 8000 turns in the secondary coil. It is connected to a 220 $V$ main supply. The potential difference per turn in secondary coil is

(*a*) 1.1 $V$ (*b*) 11 $V$

(*c*) 0.55 $V$ (*d*) 5.5 $V$

**6.** Two conducting spheres $A$ and $B$ of radii '$a$' and '$b$' respectively are charged to have the same electric potential. The ratio of surface charge densities of $A$ and $B$ is

($a$) $\frac{a}{b}$ ($b$) $\frac{b}{a}$

($c$) $\frac{a^2}{b^2}$ ($d$) $\frac{b^2}{a^2}$

**7.** A cylindrical wire is stretched to increase its length by 10%. The percentage increase in resistance will be

($a$) 10% ($b$) 15%

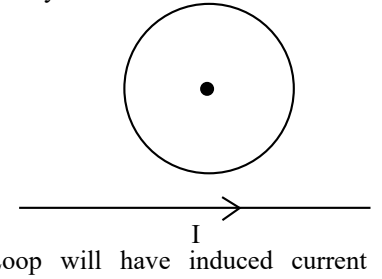
($c$) 21% ($d$) 32%

**8.** The figure shows a long cylindrical straight wire of radius a carrying steady current (I). The current (I) is uniformly distributed across the cross-section of the wire. The ratio of the magnetic fields at points $r = \frac{a}{3}$ and $r = \frac{a}{2}$, respectively is: Here r is the distance of point from the axis of cylinder.


($a$) 2 : 3 ($b$) 3 : 2

($c$) 9 : 4 ($d$) 1 : 1

**9.** A circular loop of conducting wire is placed near a current carrying wire as shown in the figure. Both are in the same plane. If the current flowing through the wire is suddenly increased.




($a$) Loop will have induced current in the anti-clockwise direction

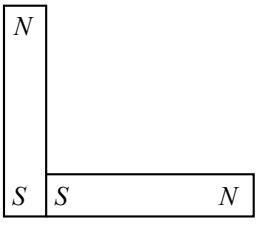
($b$) Loop will have induced current in the clockwise direction

($c$) There will be no induced current in the loop

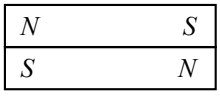
($d$) the loop will be attracted by the wire

**10.** The figure shows an arrangement of bar magnets in different configurations. Each bar magnet has a magnetic dipole moment $m$. The figure which has the maximum magnetic dipole moment _____.

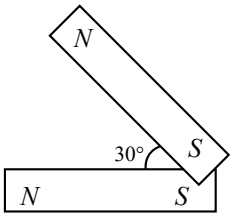
A.



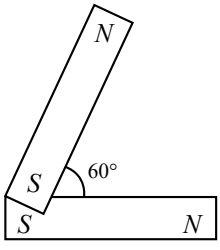

B.




C.



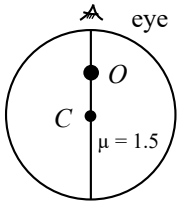

D.




($a$) configuration (A) ($b$) configuration (B)

($c$) configuration (D) ($d$) configuration (D)

**11.** There is a small air bubble inside a glass sphere ($\mu = 1.5$) of radius 10 cm. The bubble is 4.0 cm below the surface and is viewed normally from outside as shown. The apparent depth of the bubble will be




($a$) 6.0 cm below the surface

($b$) 4.0 cm below the surface

($c$) 3.0 cm below the surface

($d$) 2.0 cm below the surface

**12.** A thin prism of refractive index 1.5 when placed in air deviates a light ray by a minimum angle of 5°. The angle of minimum deviation when it is immersed in oil of refractive index 1.2 *5* is:

($a$) 2° ($b$) 4°

($c$) 5° ($d$) 2.5°

**13.** Identify the correct statement(s).

A. In any lens, the optical centre is always at the centre of the lens.

B. In a lens, if the curvature of its two surfaces is equal, the optical centre is at the centre of the lens.

C. A light ray passing through the optical centre of a lens never shifts from the direction of the incident ray.

D. A ray of light incident perpendicularly on a lens passes through its focus after refraction.

Choose the **correct** answer from the following given options.

($a$) A and B only ($b$) B only

($c$) A, B, C and D ($d$) B and C only

**14.** Arrange the following nuclei in the ascending order of their stability.

A. Oxygen ($^{16}O$) with binding energy 127.5 MeV

B. Uranium ($^{238}U$) with binding energy 1808.8 MeV

C. Helium ($^{4}He$) with binding energy 28.3 MeV

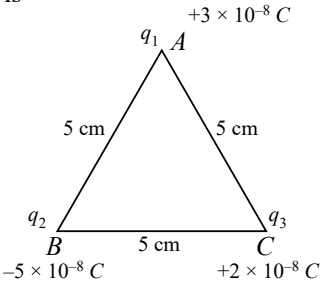
D. Iron ($^{56}Fe$) with binding energy 490 MeV

Choose the **correct** answer from the options given below:

(*a*) C, D, A, B (*b*) C, A, D, B

(*c*) C, B, A, D (*d*) C, A, B, D

**15.** Three point charges are placed at the corners of an equilateral triangle *ABC* as shown. The work done to put together these charges from infinity to their respective locations is




(*a*) $3.42 \times 10^{-4}$ J (*b*) $34.2 \times 10^{-4}$ J

(*c*) $-3.42 \times 10^{-4}$ J (*d*) $-5.5 \times 10^{-4}$ J

**16.** Which of the following statements is **correct** for a charged metallic shell?

(*a*) The electric field intensity is zero inside the shell and decreases outside the shell as we move away from the shell.

(*b*) The electric field intensity is uniform inside the shell and decreases outside the shell as v/e move away from its center.

(*c*) The electric potential is zero inside the shell and decreases outside the shell as we move away from its center.

(*d*) The electrostatic potential increases linearly with the distance from its center inside the shell.

**17.** The intensity of transmitted light is maximum when a Polaroid sheet ($P_2$) is rotated between two crossed Polaroids, $P_1$ and $P_3$ when

(*a*) the angle between $P_1$ and $P_2$ and $P_2$ and $P_3$ will be $\frac{\pi}{4}$

(*b*) polaroids $P_1$ and $P_2$ are crossed

(*c*) angle between $P_1$ and $P_2$ is $\frac{\pi}{3}$ and between $P_2$ and $P_3$ is $\frac{\pi}{6}$

(*d*) the angle between $P_2$ and $P_3$ does not matter

**18.** When light passes from air to glass, then

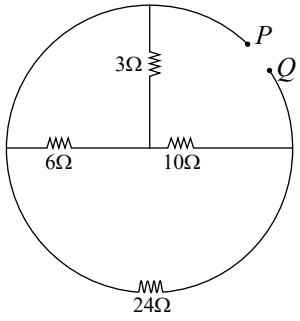
(*a*) its wavelength increases and velocity decreases.

(*b*) its wavelength and velocity both decrease.

(*c*) its wavelength decreases but velocity increases.

(*d*) its wavelength and velocity both increase.

**19.** The equivalent resistance between *P* and *Q* is:




(*a*) 8 Ω (*b*) 7.5 Ω

(*c*) 16 Ω (*d*) 12 Ω

**20.** Three point charges $+q$, $+q$ and $-2q$ are placed at the corner of an equilateral triangle of side '*a*'. The net dipole moment of the system is

(*a*) Zero (*b*) $2qa$

(*c*) $\frac{1}{\sqrt{3}}qa$ (*d*) $qa\sqrt{3}$

**21.** Two cells of emf *E* and $2E$ with internal resistances *r* and $3r$, respectively are connected in parallel. The emf and internal resistance of the combination is:

(*a*) $\frac{4}{3}E, \frac{2}{3}r$ (*b*) $\frac{1}{4}E, \frac{3}{2}r$

(*c*) $\frac{5}{4}E, \frac{3}{4}r$ (*d*) $\frac{2}{3}E, \frac{1}{2}r$

**22.** A step-up transformer operates on a 220 *V* line and supplies a current of 2 *A*. The ratio of primary and secondary winding is 1 : 25. Assuming 100% efficiency, the output power of the transformer is:

(*a*) 11000 W (*b*) 22000 W

(*c*) 36000 W (*d*) 44000 W

**23.** Identify the electromagnetic waves as per their following use/applications.

A. $\lambda_1$ is used to produce heating effect

B. $\lambda_2$ is used in satellite communication

C. $\lambda_3$ is absorbed by the ozone layer

D. $\lambda_4$ is used for studying crystal structure

Choose the **correct** answer from the options given below:

(*a*) A-Microwave, B-Visible, C-UV, D-Infrared

(*b*) A-Infrared, B-Microwave, C-Ultraviolet, D- Visible

(*c*) A-Infrared, B-Microwave, C-Ultraviolet, D- X-rays

(*d*) A-UV, B-Microwave, C-Infrared, D-Visible

**24.** Match List-I with List-II.

| List-I (Phenomenon) | | List-II (Characteristics) | |
|---|---|---|---|
| A. | Reflection | I. | Used for reducing glare |
| B. | Refraction | II. | Change in path when a light is incident on opaque medium |

| C. | Interference | III. | Change in path when a light is incident on transparent medium |
|---|---|---|---|
| D. | Polarisation | IV. | Light added to light to produce darkness |

Choose the **correct** answer from the options given below:

(*a*) A-III, B-I, C-IV, D-II

(*b*) A-II, B-III, C-I, D-IV

(*c*) A-III, B-II, C-IV, D-I

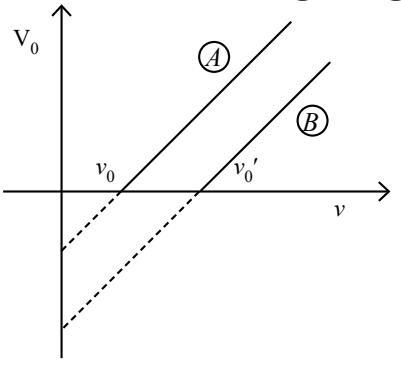
(*d*) A-II, B-III, C-IV, D-I

**25.** Two identical metal balls, *A* and *B*, with similar charges *Q*, are suspended with insulating threads. They repel each other with a force F. Another identical uncharged metal ball *C* is first touched with metal ball *A* and then touched with metal ball *B* and finally removed. The new force of repulsion between *A* and *B* will be

(*a*) F (*b*) 2F

(*c*) $\frac{1}{8}$F (*d*) $\frac{3}{8}$F

**26.** The graphs of stopping potential versus frequency of incident radiation for two metals (*A*) and (*B*) are given.




Identify the correct statement(s) from the following

A. The slope of the graphs is equal to the Planck's constant

B. Intercept on the (–*y*) axis is equal to (work function/e).

C. Threshold frequency for metal (*A*) is higher than metal (*B*)

D. Work function for metal (*B*) is greater than metal (*A*)

Choose the **correct** answer from the options given below:

(*a*) D only (*b*) A and D only

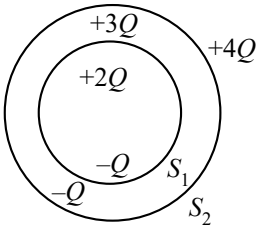
(*c*) A and C only (*d*) B and D only

**27.** A proton moves with a velocity equal to $\left(\frac{1}{20}\right)^{\text{th}}$ of velocity of light. The associated de-Broglie wavelength is:

(*a*) $1.3 \times 10^{-12}$ *m* (*b*) $1.98 \times 10^{-14}$ *m*

(*c*) $3.2.65 \times 10^{-14}$ *m* (*d*) $4.1.6 \times 10^{12}$ *m*

**28.** In the given figure, the ratio of electric fluxes through surfaces $S_1$ and $S_2$ is




(*a*) 1 : 3 (*b*) 1 : 6

(*c*) 1 : 7 (*d*) 1 : 2

**29.** The rate of change of current which produces an induced emf of 100 *V* in an inductor of inductance 10 H is

(*a*) 8 *A/s* (*b*) 10 *A/s*

(*c*) 12.5 *A/s* (*d*) 14 *A/s*

**30.** If the mass of a proton is 1.007825 *u* and the mass of the neutron is 1.008665 *u*, the mass defect in the formation of $^{7}_{3}$Li nucleus is: (take the mass of Lithium nucleus as 7.000000 *u*)

(*a*) 0.058135 *u* (*b*) 0.057295 *u*

(*c*) 0.016490 *u* (*d*) 0.056420 *u*

**31.** An external voltage is applied across a diode such that the n-side is positive and the p-side is negative. As a result,

A. the barrier height decreases

B. the barrier height increases

C. the depletion region widens

D. the depletion region width decreases

E. no change in barrier height

Choose the **correct** answer from the options given below:

(*a*) A and B only (*b*) C and E only

(*c*) D and E only (*d*) B and C only

**32.** When a magnet is being brought towards a coil, the emf induced in the coil does not depend on:

(*a*) the number of turns in the coil

(*b*) the speed of the magnet

(*c*) the pole strength of the magnet

(*d*) the resistance of the coil

**33.** A piece of copper and a piece of germanium are cooled from room temperature 20°C down to 80 K. The resistance of

(*a*) both of them will increase.

(*b*) both of them will decreases.

(*c*) copper increases and that of germanium decreases.

(*d*) copper decreases and that of germanium increases.

**34.** An electron is moving at a velocity of $3.2 \times 10^{7}$ m/s in a magnetic field along a circular path of radius 20 cm. The magnitude of the magnetic field applied is (approximately)

(*a*) $6 \times 10^{-4}$ T (*b*) $8.43 \times 10^{-5}$ T

(*c*) $9 \times 10^{-4}$ T (*d*) $9 \times 10^{-5}$ T

**35.** Voltage sensitivity of a moving coil galvanometer doesn't depend on:

(*a*) Magnetic field

(*b*) Number of turns of the coil

(*c*) Resistance of the coil

(*d*) torsional constant of the spring

**36.** When a radiation is incident on a metal surface of work function ($\Phi_0$), photo electrons are emitted with some maximum kinetic energy ($k$). If the frequency of the incident radiation is doubled, then the maximum kinetic energy of the emitted photo electrons will become

(*a*) $2\,k$ (*b*) $2k - < \Phi_0$

(*c*) $2k + \Phi_0$ (*d*) $k$

**37.** Rainbow is a phenomenon due to the combined effect of

A. Interference B. Dispersion

C. Reflection D. Refraction

E. Scattering

Choose the **correct** answer from the options given below:

(*a*) A, B and C only (*b*) B, C and D only

(*c*) A only (*d*) C, D and E only

**38.** An electric dipole is kept in an electric field which is increasing in $+x$ direction. The dipole moment of the dipole is also along the $+x$ direction. Which of the following options is correct for the electric dipole.

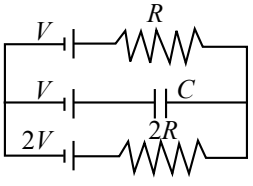
(*a*) Electric dipole will not experience any force in the presence of the electric field $(\vec{E})$

(*b*) Electric dipole will experience force and try to align perpendicular to the direction of electric field $(\vec{E})$.

(*c*) Electric dipole will experience a net force in $+x$ direction.

(*d*) Electric dipole will experience a net force in $-x$ direction.

**39.** In the given circuit when steady current flows, the potential drop across the capacitor is:




(*a*) $V$ (*b*) $\frac{V}{3}$

(*c*) $\frac{V}{2}$ (*d*) $\frac{2V}{3}$

**40.** An electron in a hydrogen atom emits wavelengths during the transitions given below. Arrange these wavelengths in ascending order:

A. from $n = 3$ to $n = 2$

B. from $n = 2$ to $n = 1$

C. from $n = \infty$ to $n = 1$

D. from $n = \infty$ to $n = 3$

E. from $n = 4$ to $n = 1$

Choose the **correct** answer from the options given below:

(*a*) C, B, E, A, D (*b*) C, E, B, D, A

(*c*) C, B, A, E, D (*d*) C, E, B, A, D

**41.** A conducting circular loop is placed in a uniform magnetic field of 0.5 T, with its plane perpendicular to the magnetic field. The radius of the loop starts shrinking at the rate of 4 mm/$s$. When the radius of the loop is 4 cm, the induced emf in the loop is

(*a*) $3.2\pi\ \mu V$ (*b*) $1.6\pi\ \mu V$

(*c*) $0.8\pi\ \mu V$ (*d*) $160\ \pi\ \mu V$

**42.** An electron is projected into a magnetic field of flux density 10 Wb/m$^2$ with a velocity of $3 \times 10^7$ m/s at an angle of 30° to the field. The magnetic force on the electron is:

(*a*) $1.6 \times 10^{-11}\ N$ (*b*) $4.8 \times 10^{-11}\ N$

(*c*) $2.4 \times 10^{-11}\ N$ (*d*) $9.2 \times 10^{-11}\ N$

**43.** Kirchhoff's second law for an electric network is based on:

(*a*) Law of conservation of mass

(*b*) Law of conservation of charge

(*c*) Law of conservation of energy

(*d*) Law of conservation of momentum

**44.** The ratio of radii of the nuclei with the mass numbers given as 2, 16, 54 and 128, respectively, will be

(*a*) 1 : 3 : 4 : 8 (*b*) 1 : 2 : 3 : 4

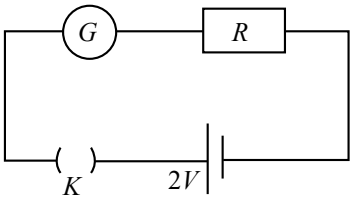
(*c*) 2 : 3 : 4 : 5 (*d*) 1 : 3 : 5 : 7

**45.** In a diffraction experiment, the screen is placed 2 $m$ away from a narrow slit. The first minimum observed is at 5 mm on either side of the central maximum for wavelength of $5 \times 10^{-5}$ cm. The width of the slit is:

(*a*) 0.01 cm (*b*) 0.02 cm

(*c*) 0.11 cm (*d*) 0.12 cm

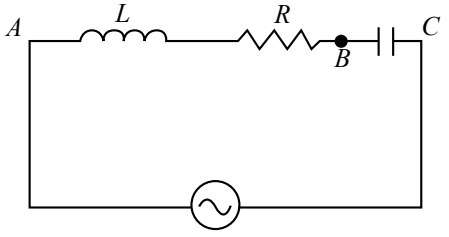
**46.** In the given circuit, the resistance of the galvanometer is $G = 100\ \Omega$. Resistance box $R$ contributes 4900 Ω. When key $K$ is closed. The needle of the galvanometer deflects to the 20$^{th}$ division. The figure of merit of the galvanometer is:




(*a*) $2 \times 10^{-5}\ A$/div (*b*) $2 \times 10^{-4}\ A$/div

(*c*) $5 \times 10^{-5}\ A$/div (*d*) $5 \times 10^{-4}\ A$/div

**47.** An LCR series circuit, with $L = \frac{2}{\pi} H$, $R = 100\ \Omega$ and $C = \frac{100}{\pi}\ \mu F$ is connected across a source of 200 $V$, 50 Hz as shown. The peak potential difference between $A$ and $B$ is:




(*a*) 600 $V$ (*b*) $200\sqrt{5}\ V$

(*c*) $20\sqrt{5}\ V$ (*d*) $300\sqrt{2}\ V$

**48.** Which of the following has zero average value in a plane electromagnetic wave?

A. Electric field B. Magnetic field

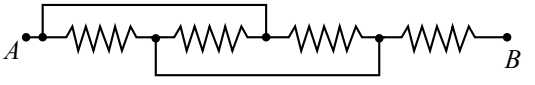
C. Electric energy D. Magnetic energy

Choose the **correct** answer from the options given below:

(*a*) A and C only (*b*) B and D only

(*c*) B only (*d*) A and B only

**49.** Four resistors of 6 Ω resistance each are joined as shown in the figure. The equivalent resistance of the combination is:




(*a*) 8 Ω (*b*) 10.5 Ω

(*c*) 24 Ω (*d*) 1.5 Ω

**50.** The magnetic field in a plane electromagnetic wave is given by $B = 3 \times 10^{-7} \sin(1.5x + 5 \times 10^8 t)T$, where $x$ is in meter and $t$ is in second. The wavelength of the wave is:

(Take: $n = 3$)

(*a*) 1.5 $m$ (*b*) 3 $m$

(*c*) 4 $m$ (*d*) 2.5 $m$

## Answer Key

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1.** (*a*) | **2.** (*b*) | **3.** (*b*) | **4.** (*c*) | **5.** (*d*) | **6.** (*b*) | **7.** (*c*) | **8.** (*a*) | **9.** (*a*) | **10.** (*b*) |
| **11.** (*c*) | **12.** (*a*) | **13.** (*d*) | **14.** (*c*) | **15.** (*c*) | **16.** (*a*) | **17.** (*a*) | **18.** (*b*) | **19.** (*a*) | **20.** (*d*) |
| **21.** (*c*) | **22.** (*a*) | **23.** (*c*) | **24.** (*d*) | **25.** (*d*) | **26.** (*d*) | **27.** (*c*) | **28.** (*d*) | **29.** (*b*) | **30.** (*a*) |
| **31.** (*d*) | **32.** (*d*) | **33.** (*d*) | **34.** (*c*) | **35.** (*d*) | **36.** (*c*) | **37.** (*b*) | **38.** (*c*) | **39.** (*b*) | **40.** (*d*) |
| **41.** (*d*) | **42.** (*c*) | **43.** (*c*) | **44.** (*b*) | **45.** (*b*) | **46.** (*a*) | **47.** (*b*) | **48.** (*d*) | **49.** (*a*) | **50.** (*c*) |

## Explanations

**1.** (*a*) Given:

$V_A = 50$ V, and $V_C = 0$ ground).

$C_2 = 4\mu F$ and $C_3 = 2\mu F$ are in parallel:

$C_{23} = C_2 + C_3 = 4 + 2 = 6\mu F$

This equivalent $C_{23}$ is in series with $C_1 = 3\mu F$.

For series:

$$\frac{1}{C_{eq}} = \frac{1}{3} + \frac{1}{6} = \frac{1}{2}$$

$C_{eq} = 2\mu F$

Charge on each series capacitor =

$Q = C_{eq} V = 2 \times 50 = 100\ \mu C$

Potential across $C_1$:

$$V_1 = \frac{Q}{C_1} = \frac{100}{3} = 33.3V$$

Hence, potential at B:

$$V_B = V_A - V_1 = 50 - \frac{100}{3} = \frac{50}{3}\text{ V}$$

**2.** (*b*) For forward biasing of diode, p-type of diode should be at higher potential than n-type at lower potential.

**3.** (*b*) Given values are:

- Magnetic field strength ($H$) = 1000$A/m$
- Magnetic susceptibility ($\chi$) = $-0.3 \times 10^{-5}$

The relationship between the intensity of magnetization ($M$), magnetic susceptibility ($\chi$), and magnetic field strength ($H$)

$M = \chi H$

Substitute the values into the formula:

$M = (-0.3 \times 10^{-5}) \times (1000)$

$M = (-0.3 \times 10^{-5}) \times (10^3)$

$M = -0.3 \times 10^{-5+3}$

$M = -0.3 \times 10^{-2}$

$M = -3 \times 10^{-3}\ A/m$

**4.** (*c*) A-IV, B-I, C-II, D-III

**5.** (*d*) Given:

$N_p = 400$, $N_s = 8000$, $V_p = 220$ V

Potential difference per turn in primary coil:

$$V_{\text{per turn}} = \frac{V_p}{N_p} = \frac{220}{400} = 0.55 \text{ V/turn}$$

Since the turn ratio is same,

Potential difference per turn in secondary coil = 0.55 V

**6.** (*b*) For a conducting sphere, potential

$$V = \frac{1}{4\pi\varepsilon o}\frac{Q}{R}$$

Given $V_A = V_B$, so

$$\frac{Q_A}{a} = \frac{Q_B}{b} \Rightarrow \frac{Q_A}{Q_B} = \frac{a}{b}$$

Surface charge density $\sigma = \frac{Q}{4\pi R^2}$

$$\frac{\sigma_A}{\sigma_B} = \frac{Q_A / a^2}{Q_B / b^2} = \frac{(a/b)}{(a^2/b^2)} = \frac{b}{a}$$

**7.** (*c*) Given: wire length increases by 10%, i.e.

$L_2 = 1.1L_1$

Volume remains constant $\Rightarrow$

$$A_1L_1 = A_2L_2 \Rightarrow A_2 = \frac{A_1}{1.1}$$

Resistance $R = \rho\frac{L}{A}$

So,

$$\frac{R_2}{R_1} = \frac{L_2 / A_2}{L_1 / A_1} = \frac{1.1}{1/1.1} = (1.1)^2 = 1.21$$

Percentage Increase: The fractional increase is $\frac{R_2 - R_1}{R_1}$.

Fractional Increase

$$= \frac{1.21R_1 - R_1}{R_1} = \frac{0.21R_1}{R_1} = 0.21$$

Percentage Increase = 0.21 × 100% = 21%

**8.** (*a*) The magnetic field $B$ is directly proportional to the distance $r$ from the axis ($B \propto r$):

$$\frac{B_1}{B_2} = \frac{r_1}{r_2}$$

Magnetic Field at $r_1 = \frac{a}{3}(B_1)$:

$$B_1 = \frac{\mu_0 I(a/3)}{2\pi a^2}$$

Magnetic Field at $r_2 = \frac{a}{2}(B_2)$:

$$B_2 = \frac{\mu_0 I(a/2)}{2\pi a^2}$$

Ratio $\frac{B_1}{B_2}$: We take the ratio, canceling all common terms $\left(\frac{\mu_0 I}{2\pi a^2}\right)$:

$$\frac{B_1}{B_2} = \frac{a/3}{a/2}$$

$$\frac{B_1}{B_2} = \frac{1/3}{1/2}$$

$$\frac{B_1}{B_2} = \frac{1}{3} \times \frac{2}{1} = \frac{2}{3}$$

The ratio of the magnetic fields is 2: 3.

**9.** (*a*) **The loop will have induced current in the anti-clockwise direction**

This is based on **Faraday's Law of Induction and Lenz's Law.**

**10.** (*b*) The magnitude of the resultant moment is given by:

$$M_{net} = \sqrt{m_1^2 + m_2^2 + 2m_1m_2\cos\theta}$$

where θ is the angle between the two dipole moments. Since $m_1 = m_2 = m$ for all configurations:

$$M_{net} = \sqrt{m^2 + m^2 + 2m^2\cos\theta}$$

$$= m\sqrt{2(1+\cos\theta)}$$

To maximize $M_{\text{net}}$, we must maximize cos θ, which occurs when θ = 0°.

**11.** (*c*) The image of the air bubble is formed because of refraction at the spherical glass-air interface. The light rays travel from glass ($\mu_1 = 1.5$) to air ($\mu_2 = 1$).

Given:

Using the refraction formula for a spherical surface,

$$\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$$

Substituting the values:

$$\frac{1}{v} - \frac{1.5}{-4} = \frac{1-1.5}{-10}$$

$$\frac{1}{v} = \frac{1.5}{4} + \frac{0.5}{10}$$

$$\frac{1}{v} = -\frac{1}{3} \Rightarrow v = -3.0\,\text{cm}$$

Hence, the apparent position of the bubble is 3.0 cm below the surface.

**12.** (*a*) For a thin prism,

$\delta = (\mu_{\text{rel}} - 1)A$

where $\mu_{\text{rel}} = \frac{\mu_{\text{prism}}}{\mu_{\text{medium}}}$

Given in air ($\mu_{\text{medium}} = 1$):

$$5° = (1.5 - 1)A \Rightarrow A = \frac{5°}{0.5} = 10°$$

Now, in oil ($\mu_{\text{medium}} = 1.25$):

$$\delta' = \left(\frac{1.5}{1.25} - 1\right)$$

$A = (1.2 - 1) \times 10° = 0.2 \times 10° = 2°$

**13.** (*d*) B and C only

**14.** (*c*) Stability depends on binding energy per nucleon = (total binding energy) ÷ (mass number).

Let's calculate roughly:

- C ($^4$He): 28.3/4 = 7.1 MeV/nucleon
- A ($^{16}$O): 127.5/16 = 7.97 MeV/nucleon
- D ($^{56}$Fe): 490/56 = 8.75 MeV/nucleon
- B ($^{238}$U): 1808.8/238 = 7.6 MeV/nucleon

Ascending order (least stable → most stable):

C < B < A < D

**15.** (*c*) The work done ($W$) is equal to the total electrostatic potential energy ($U$) of the system:

$$W = U = k\frac{q_Aq_B + q_Bq_C + q_Cq_A}{r}$$

Given values: $k = 9 \times 10^9$ N m$^2$/C$^2$, $r$ = 5 cm = $5 \times 10^{-2}$ m Charges (in units of $10^{-8}$, $q_A = +3$, $q_B = -5$, $q_C = +2$

Product of Charge Pairs (in units of $10^{-16} \times$ C$^2$):

$q_Aq_B = (3)(-5) = -15$

$q_Bq_C = (-5)(2) = -10$

$q_Cq_A = (2)(3) = 6$

Sum = – 15 – 10 + 6 = 19

**Total Work:**

$$W = \frac{9\times10^9}{5\times10^{-2}} \times (-19) \times 10^{-16}$$

$W = (1.8 \times 10^{11}) \times (-19) \times 10^{-16}$

$W = -34.2 \times 10^{-5}$ J

$W = -3.42 \times 10^{-4}$ J

**16.** (*a*)

**17.** (*a*) When the two outer polaroids ($P_1$ and $P_3$) are crossed (angle 90° or $\frac{\pi}{2}$), the intensity of light transmitted through the system is given by the three-polaroid application of Malus's Law:

$$I_{\text{trans}} = \frac{I_{\text{incident}}}{4}\sin^2(2\theta_1)$$

where $\theta_1$ is the angle between $P_1$ and the middle polaroid $P_2$.

The intensity is maximum when $\sin(2\theta_1) = 1$:

$$2\theta_1 = \frac{\pi}{2} \Rightarrow \theta_1 = \frac{\pi}{4}$$

# 1

# MOCK TEST PAPER

## Instructions

***There will be 50 questions. All questions are compulsory. Each question carries 5 marks. One mark will be deducted for a wrong answer.***

***Full Marks: 250*** ***(Time: 60 Minutes)***

**1.** Two charged spheres separated at a distance R exert a force F on each other. If they are immersed in a liquid of dielectric constant 5 then what is the new force between them

(*a*) $\frac{F}{5}$ (*b*) F (*c*) 5F (*d*) $\frac{F}{2}$

**2.** A 2μF capacitor is charged to a potential 500V and then the plates of the capacitor are joined through a resistance. The heat produced in the resistance in joule is

(*a*) $60 \times 10^{-2}$ Joule (*b*) $25 \times 10^{-2}$ Joule

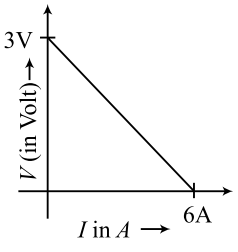
(*c*) $0.25 \times 10^{-2}$ Joule (*d*) $0.5 \times 10^{-2}$ Joule

**3.** The kinetic energy of an electron which is accelerated in the potential difference of 100V is

(*a*) $1.6 \times 10^{-17}$ J (*b*) $1.6 \times 10^{-14}$ J

(*c*) $1.6 \times 10^{-10}$ J (*d*) $1.6 \times 10^{-8}$ J

**4.** The variation of terminal potential difference (*V*) with current flowing through a cell is as shown. The emf and internal resistance of the cell are




(*a*) 6 V, 2 Ω (*b*) 3 V, 2 Ω

(*c*) 6 V, 0.5 Ω (*d*) 3 V, 0.5 Ω

**5.** The potential of the electric field produced by point charge at any point (x,y,z) is given by $V = 3x^2 + 5$ where x,y are in meter and V is in volt. The intensity of electric field at (–2, 1, 0) is

(*a*) +17 $Vm^{-1}$ (*b*) –19 $Vm^{-1}$

(*c*) +12 $Vm^{-1}$ (*d*) –12 $Vm^{-1}$

**6.** Ohm's law is true

(*a*) For metallic conductors at constant temperature

(*b*) For metallic conductors at variable temperature

(*c*) For electrolytes when current passes through them

(*d*) For diode when current flows

**7.** The lowest resistance which can be obtained by connecting 10 resistors each of $\frac{1}{10}$ ohm is

(*a*) $\frac{1}{250}$ ohm (*b*) $\frac{1}{200}$ ohm

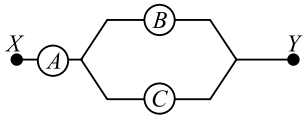
(*c*) $\frac{1}{100}$ ohm (*d*) $\frac{1}{10}$ ohm

**8.** Which of the following Maxwell's equations which is valid for time varying conditions but not valid for static conditions: *[2023, I]*

(*a*) $\oint \vec{D}.\vec{dA} = Q$ (*b*) $\oint \vec{E}.\vec{dl} = 0$

(*c*) $\oint \vec{E}.\vec{dl} = -\frac{\partial \phi_B}{\partial t}$ (*d*) $\oint \vec{B}.\vec{dl} = \mu_0 I$

**9.** Three voltmeters *A, B* and *C* having resistances *R*, 1.5*R* and 3*R* respectively are used in a circuit as shown. When a P.D. is applied between *X* and *Y*, the reading of the voltmeters are $V_1$, $V_2$ and $V_3$ respectively. Then




(*a*) $V_1 = V_2 = V_3$ (*b*) $V_1 < V_2 = V_3$

(*c*) $V_1 > V_2 > V_3$ (*d*) $V_1 > V_2 = V_3$

**10.** Among two interfering sources, let A be ahead in phase by 54° relative to B. If the observations be taken from point

P, such that PB – PA = 1.5 λ, deduce the phase difference between the waves from A and B reaching P.

(*a*) 33π radian (*b*) 2.3π radian

(*c*) 11π radian (*d*) 3.3π radian

**11.** Read the following statements carefully:

**Statement-I:** A solenoid tends to expand when a current passes through it.

**Statement-II:** Two straight parallel metallic wires carrying current in the same direction repel each other.

**Statement-III:** The magnetic field inside a long straight solenoid is uniform and along the axis of the solenoid.

**Statement-IV:** A charged particle moving parallel to a magnetic field experiences no force.

Choose the correct statements:

(*a*) Statements I and II only

(*b*) Statements III, and IV only

(*c*) Statements II and III only

(*d*) Statements I, III, and IV only

**12.** A bar magnet is placed in the position of stable equilibrium in a uniform magnetic field of induction B. If it is rotated through an angle 180°, then the work done is:

(*a*) MB (*b*) 2MB (*c*) MB/2 (*d*) Zero

**13.** Four types of magnetic materials are listed below:

A. Ferromagnetics B. Diamagnetics

C. Paramagnetics

Choose the correct order of the materials in increasing order of magnetic susceptibility.

(*a*) (A), (B), (C) (*b*) (B), (A), (C)

(*c*) (B), (C), (A) (*d*) (C), (A), (B)

**14.** The nature of light which is verified by the interference event will be

(*a*) Dual nature (*b*) Wave nature

(*c*) Particle nature (*d*) Quantum nature

**15.** Which of the following is constructed on the principle of electromagnetic induction?

(*a*) Galvanometer (*b*) Electric motor

(*c*) Generator (*d*) Voltmeter

**16.** Match Column-I with Column-II:

| | Column-I | | Column-II |
|---|---|---|---|
| A. | Electrical conductivity of conductor depends on | (i) | dimensions (length, area of cross section etc.) |
| B. | Conductance of a conductor depends on | (ii) | temperature |
| C. | For a conductor of given dimensions and at a given temperature, current density depends on | (iii) | nature of conductor |
| D. | For a given potential difference applied across a conductor of given length, current in it will depend on | (iv) | electric field strength |

(*a*) A-(i), B-(ii, iii), C-(iv), D-(ii)

(*b*) A-(ii, iii), B-(i, ii, iii), C-(*i*ii, iv), D-(i, ii, iii)

(*c*) A-(v), B-(ii), C-(iii), D-(iv)

(*d*) A-(iii), B-(v), C-(ii), D-(i)

**17.** The impedance (Z) in an AC circuit with different configurations of resistors, capacitors, and inductors is as follows: (Take R = 20Ω, $X_C$ = 5Ω, $X_L$ = 10Ω)

A. Purely resistive circuit B. RC series circuit

C. RL series circuit

The impedance of these circuits arranged in increasing order is _____.

(*a*) (B), (C), (A) (*b*) (A), (B), (C)

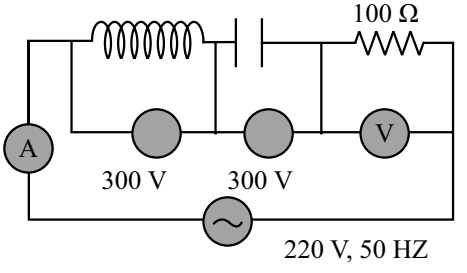
(*c*) (B), (A), (C) (*d*) (C), (A), (B)

**18.** If net reactance in a circuit is $\sqrt{3}$ times of resistance, then find phase difference.

(*a*) Zero (*b*) 30°

(*c*) 60° (*d*) Data is incomplete

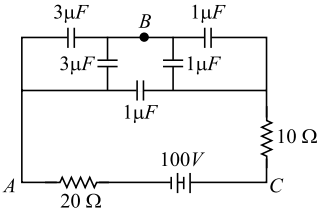
**19.** In the circuit shown below, what will be the readings of the voltmeter and ammeter




(*a*) 800 V, 2A (*b*) 300 V, 2A

(*c*) 220 V, 2.2 A (*d*) 100 V, 2A

**20.** In the diagram below, what is the potential difference between points A and B, and between points B and C, respectively, in the steady state?




(*a*) $V_{AB} = V_{BC} = 50\ V$ (*b*) $V_{AB} = 75V, V_{BC} = 25\ V$

(*c*) $V_{AB} = 25\ V, V_{BC} = 75V$ (*d*) $V_{AB} = V_{BC} = 100V$

**21.** A plano convex lens fits exactly into a plano concave lens, with their plane surface are parallel to each other. If the lenses are made of different materials of refractive indices $\mu_1$ & $\mu_2$ and *R* is the radius of curvature of the surfaces of the lenses, then what is the focal length of combination ?

(*a*) $\frac{R}{\mu_1 - \mu_2}$ (*b*) $\frac{2R}{\mu_1 + \mu_2}$

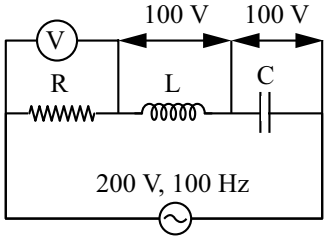
(*c*) $\frac{R}{2(\mu_1 - \mu_2)}$ (*d*) $\frac{R}{2(\mu_1 + \mu_2)}$

**46.** A transformer has 100 turns in the primary coil and carries 8 A current. If input power is 1 kW, the number of turns in secondary coil to have 500 V output will be

(*a*) 150 (*b*) 240

(*c*) 400 (*d*) 360

**47.** In the circuit shown in figure, what will be the reading of the voltmeter ?



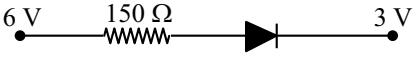

(*a*) 100 V (*b*) 900 V (*c*) 200 V (*d*) 600 V

**48.** The lower Bohr orbit in hydrogen atom has

(*a*) The maximum energy (*b*) The least energy

(*c*) Zero energy (*d*) Infinite energy

**49.** The current through the ideal diode as shown in figure is




(*a*) 0 A (*b*) 0.02 A (*c*) 0.05 A (*d*) 0.08 A

**50.** A cube of side x has a charge q at each of its vertices. The potential due to this charge array at the centre of the cube is

(*a*) $\frac{5q}{3\pi\varepsilon_0 x}$ (*b*) $\frac{4q}{\sqrt{3}\pi\varepsilon_0 x}$

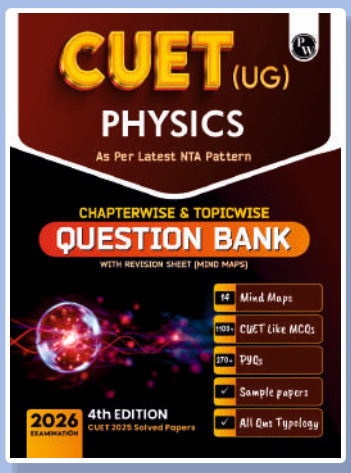
(*c*) $\frac{3q}{4\pi\varepsilon_0 x}$ (*d*) $\frac{7q}{\sqrt{3}\pi\varepsilon_0 x}$

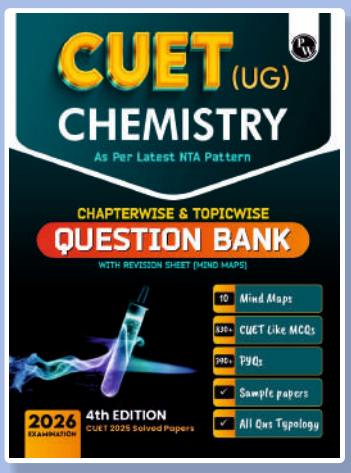
## Answer Key

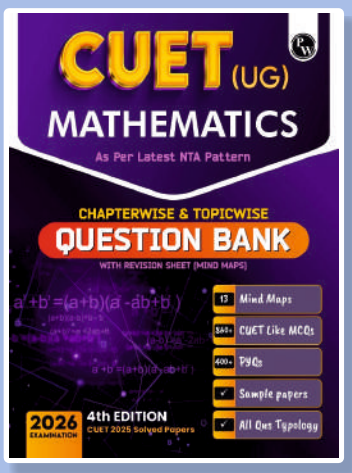
**(Scan QR Code for Detailed Explanations)**

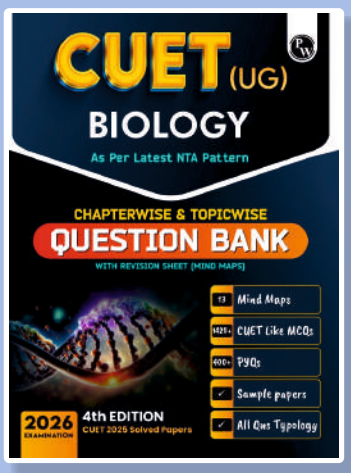
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1.** (*a*) | **2.** (*b*) | **3.** (*a*) | **4.** (*d*) | **5.** (*c*) | **6.** (*a*) | **7.** (*c*) | **8.** (*b*) | **9.** (*a*) | **10.** (*d*) |
| **11.** (*b*) | **12.** (*b*) | **13.** (*c*) | **14.** (*b*) | **15.** (*c*) | **16.** (*b*) | **17.** (*b*) | **18.** (*c*) | **19.** (*c*) | **20.** (*c*) |
| **21.** (*a*) | **22.** (*c*) | **23.** (*b*) | **24.** (*c*) | **25.** (*a*) | **26.** (*d*) | **27.** (*a*) | **28.** (*c*) | **29.** (*b*) | **30.** (*d*) |
| **31.** (*c*) | **32.** (*a*) | **33.** (*d*) | **34.** (*c*) | **35.** (*c*) | **36.** (*d*) | **37.** (*c*) | **38.** (*b*) | **39.** (*a*) | **40.** (*b*) |
| **41.** (*a*) | **42.** (*a*) | **43.** (*b*) | **44.** (*a*) | **45.** (*b*) | **46.** (*c*) | **47.** (*c*) | **48.** (*b*) | **49.** (*b*) | **50.** (*b*) |

# Complete Your Preparation

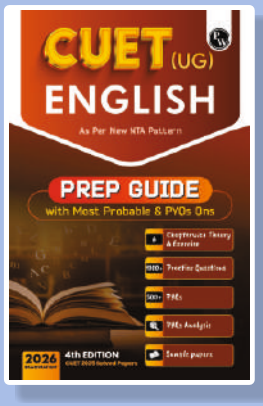


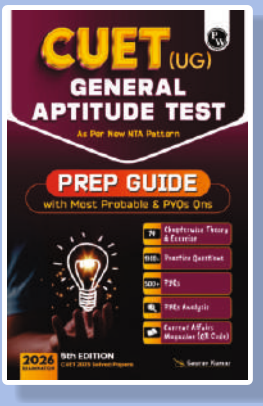





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